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PROCEEDINGS
OF THE
ROYAL SOCIETY OF LONDON.

From June 17, 1869, to June 16, 1870.

VOL. XVIII.

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ERRATA.

- Vol. xvi. page 346, line 8 from bottom, *for* instead of a depth *read* in seas of a depth.
 „ xvii. „ 345, line 8 from bottom, *for* $\delta N = -157''-156$ *read* $\delta N = +157''-156$.
 „ xviii. „ 207, line 10 from bottom, *before and after the words* “Stream-lines generated by a Sphere,” *delete* the marks of quotation.

NOTICE TO BINDER.

Plate II. to face p. 352. Plate III. to face p. 359.

which receives the vibrations, such as making it a narrow cylinder with one end closed, making it of cotton-wool, &c. It is found that in all cases the suspended body approaches the vibrating one.

The author concludes that the effect of apparent attraction is due to atmospheric pressure, and that this pressure is due to undulatory dispersion. It is suggested that the dispersion of the vibrations which constitute radiant heat may cause bodies to approach, being pushed not pulled.

November 18, 1869.

Lieut.-General Sir EDWARD SABINE, K.C.B., President, in
the Chair.

In pursuance of the Statutes, notice of the ensuing Anniversary Meeting was given from the Chair.

Dr. T. Graham Balfour, Mr. Fergusson, Mr. Hanbury, Dr. Hoskins, and Mr. Tomlinson, having been nominated by the President, were elected by ballot Auditors of the Treasurer's Accounts on the part of the Society.

Mr. William Esson, and Mr. Edward Walker were admitted into the Society.

The Presents received were laid on the Table, and thanks ordered for them, as follows :—

Transactions.

- Apt (Vauchuse):—Société Littéraire, Scientifique et Artistique. *Annales*; quatrième année, 1866–67. 8vo. *Apt* 1869. The Society.
- Batavia:—Koninklijke Natuurkundige Vereeniging in Nederlandsch Indië. *Natuurkundig Tijdschrift*. Deel XXX. Afl. 3–6. 8vo. *Batavia* 1868. The Society.
- Berlin:—Königliche Akademie der Wissenschaften. *Abhandlungen*, aus dem Jahre 1868. 4to. *Berlin* 1869. Monatsbericht. April–August 1869. 8vo. *Berlin* 1869. The Academy.
- Verein zur Beförderung des Gewerbflusses in Preussen. *Verhandlungen*, Jan.–April 1869. 4to. *Berlin* 1869. The Society.
- Boston Society of Natural History. *Memoirs*. Vol. I. Part 4. 4to. *Boston* 1869. The Society.
- Cambridge Philosophical Society. *Transactions*. Vol. X. Title and Index. Vol. XI. Part 2. 4to. *Cambridge* 1869. Proceedings. Parts 3–6. 8vo. *Cambridge* 1866–67. The Society.
- Copenhagen:—Kongelige Danske Videnskabernes Selskab. *Skrifter*. 5 Række. Nat. og Math. Afd. Bind. VIII. 2 (Lütken). 4to. *Kjöbenhavn* 1869. Oversigt 1815–16, 1816–17, 1817–18, 1818–19, 1819–20, 1820–21, 1821–22, 1822–23, 1824–25, 1825–26, 1826–27, 1827–28, 1828–29, 1829–30, 1830–31, 1833–34, 1836–37. 4to. 1842, 1860, 1867, Nos. 6–7; 1868, Nos. 1–4; 1869, No. 1. 8vo. *Kjöbenhavn*. The Society.

Transactions (*continued*).

Dublin :—Trinity College. Observations made at the Magnetical and Meteorological Observatory, under the direction of Humphrey Lloyd, D.D. Vol. II. 1844–50. 4to. *Dublin* 1869.

The Provost and Senior Fellows.

Edinburgh :—Royal Physical Society. Proceedings. Session 1865–66. 8vo. *Edinburgh*. The Society.

Royal Scottish Society of Arts. Transactions. Vol. VII. Parts 4, 5. 8vo. *Edinburgh* 1868. The Society.

Greenwich :—Royal Observatory. Astronomical, Magnetical, and Meteorological Observations made in the year 1867, under the direction of G. B. Airy. 4to. *London* 1869. The Admiralty.

Halle :—Naturw. Verein für Sachsen und Thüringen. Zeitschrift für die gesammten Naturwissenschaften : redigirt von C. Giebel und M. Siewert. Band XXXII. 8vo. *Berlin* 1868. The Society.

Heidelberg :—Naturhistorisch-medizinischer Verein. Verhandlungen. Band II., IV., V., 2. 8vo. *Heidelberg* 1862–69. The Society.

Kiel :—Universität. Schriften, aus dem Jahre 1868. Band XV. 4to. *Kiel* 1869. The University.

London :—Anthropological Society. Anthropological Review. Nos. 16, 17, 26, 27. 8vo. *London* 1867–69. The Society.

Army Medical Department. Report for the year 1867. Vol. IX. 8vo. *London* 1869. The Department.

British Association for the Advancement of Science. Report of the Thirty-eighth Meeting, held at Norwich in August 1868. 8vo. *London* 1869. The Association.

Entomological Society. Transactions. Third Series. Vol. III. Part 7. For the year 1869, Parts 2–4. 8vo. *London* 1869. The Society.

Institution of Civil Engineers. Minutes of Proceedings. Vols. XXVII., XXVIII. 8vo. *London* 1868–69. The Institution.

Institution of Naval Architects. Transactions. Vol. X. 4to. *London* 1869. The Institution.

Linnean Society. Transactions. Vol. XXVI. Part 3. 4to. *London* 1869. Proceedings, 1868–69, pp. xli–cxxxiv. Journal. Botany, Vol. X. No. 48 ; Vol. XI. Nos. 50 & 51 ; Vol. XII. Zoology, Vol. X. No. 46. 8vo. *London* 1869. The Society.

Meteorological Office. Weather Reports, Jan. 1 to June 30, 1869. Fol. *London*. Report of the Meteorological Committee of the Royal Society for the year ending 31st December 1868. 8vo. *London* 1869. Report to the Committee on the Meteorology of the North Atlantic between the parallels of 40° and 50° N., by Captain Henry Toynbee. 8vo. *London* 1869. Charts showing the Surface-temperature of the South-Atlantic Ocean in each month of the year. Fol. *London* 1869. The Office.

Transactions (*continued*).

- Odontological Society of Great Britain. Transactions. Vol. VI. New Series. Vol. I. No. 8. 8vo. *London* 1868-69. The Society.
- Royal Agricultural Society. Journal. Second Series. Vol. V. Part 2. 8vo. *London* 1869. The Society.
- Zoological Society. Transactions. Vol. VI. Part 8. 4to. *London* 1869. Proceedings of the Scientific Meetings for the year 1869. Part 1. 8vo. *London*. The Society.
- Luxembourg :—Société des Sciences Naturelles. Bulletin. Tome X. Années 1867 et 1868. 8vo. *Luxembourg* 1869. The Society.
- Lyon :—Académie Impériale des Sciences, Belles-Lettres et Arts. Mémoires. Classe des Sciences, Tome X.-XV. 1860-66 ; Classe des Lettres, Nouvelle Série, Tome VII.-X., XII., XIII., 1858-68. 8vo. *Lyon*. The Academy.
- Manchester :—Literary and Philosophical Society. Memoirs. Third Series. Vol. III. 8vo. *London* 1868. Proceedings. Vols. V.-VII. 8vo. *Manchester* 1866-68. The Society.
- Milan :—Società Italiana di Scienze Naturali. Memorie. Tomo II. n. 3 Tomo IV. n. 1-3. 4to. *Milano* 1867-68. Atti. Vol. XI. fasc. 2-4. 8vo. *Milano* 1868-69. The Society.
- Naples :—Società Reale. Rendiconto delle Tornate e dei Lavori dell' Accademia di Scienze Morali e Politiche. Anno 8, Gennaio-Agosto. 8vo. *Napoli* 1869. The Society.
- Newcastle-upon-Tyne :—Chemical Society. Transactions. Part I. 8vo. *Newcastle-upon-Tyne* 1869. The Society.
- Oxford :—Radcliffe Observatory. Results of Astronomical and Meteorological Observations made in the year 1866, under the superintendence of the Rev. Robert Main. Vol. XXVI. 8vo. *Oxford* 1869. The Radcliffe Trustees.
- Palermo :—R. Istituto Tecnico. Giornale di Scienze Naturali ed Economiche. Anno 1869, Vol. V. fasc. 1-2 ; parte 1, Scienze Naturali. Roy. 8vo. *Palermo* 1869. The Institute.
- Paris :—Institut Impérial de France. Annales pour 1810, 1811, 1838, 1839, 1841, 1844, 1845, 1848, 1849, 1850, 1858, 1862, 1863, 1866-69. 12mo. *Paris*. The Institute.
- Société Géologique de France. Bulletin. 2^e série. Tome XXV. ff. 56-64 ; Tome XXVI. no. 2. 8vo. *Paris* 1869. The Society.
- Philadelphia :—Academy of Natural Sciences. Journal. New Series. Vol. VI. Part 3. 4to. *Philadelphia* 1869. Proceedings. 1868, Nos. 1-6. 8vo. *Philadelphia*. The Academy.
- American Philosophical Society. Transactions. Vol. XIII. Part 3. 4to. *Philadelphia* 1869. The Society.
- St. Petersburg :—Académie Impériale des Sciences. Mémoires. Tome XII. Nos. 4-5 ; Tome XIII. Nos. 1-7 ; Tome XIV. Nos. 1, 2. 4to.

Transactions (*continued*).

- St. Pétersbourg* 1869. Bulletin. Tome XIII. Nos. 4-5. 4to. *St. Pétersbourg* 1868-69. The Academy.
- Salem (Mass.):—Peabody Academy of Science. Memoirs. Vol. I. No. 1. Roy. 8vo. *Salem* 1869. The Academy.
- Venice:—Ateneo Veneto. Atti. Serie 2. Vol. IV. puntata 2-3; Vol. V. p. 1-3. 8vo. *Venezia* 1867-68. The Ateneo.
- Reale Istituto Veneto di Scienze, Lettere ed Arti. Memorie. Vol. XIV. parte 1, 2. 4to. *Venezia*, 1868-69. Atti. Serie 3. Tomo XII. disp. 10; Tomo XIII. disp. 1-10; Tomo XIV. disp. 1-5. 8vo. *Venezia* 1866-69. The Institute.
- Vienna:—Kaiserliche Akademie der Wissenschaften. Sitzungsberichte. Math.-Nat. Classe, I. Abtheilung: Band LVII. Hefte 4, 5. II. Abth.: Band LVII. Hefte 4, 5; Band LVIII. Heft 1. Phil.-hist. Classe: Band LIX. Hefte 1-4. 8vo. *Wien* 1868. Anzeiger. Jahrg. 1869, Nr. 12-21. 8vo. *Wien*. The Academy.
- K.-K. Geologische Reichsanstalt. Jahrbuch. Band XIX. Nr. 1. 8vo. *Wien* 1869. The Society.
- Zürich:—Allgemeine Schweizerische Gesellschaft für die gesammten Naturwissenschaften. Neue Denkschriften. Band XXXIII. 4to. *Zürich* 1869. The Society.
- Naturforschende Gesellschaft. Vierteljahrsschrift. Redigirt von Rudolph Wolf. Jahrg. 12, 13. 8vo. *Zürich* 1867-68. An die zürcherische Jugend, auf die Jahre 1868, 1869. Stück 70, 71. 4to. *Zürich* 1868-69. The Society.

- Attfield (J.) Chemistry, general, medical, and pharmaceutical. 8vo. *London* 1869. The Author.
- Brunnow (F.) *Traité d'Astronomie Sphérique et d'Astronomie Pratique*, édition Française, publiée par E. Lucas et C. André. Astronomie Sphérique. 8vo. *Paris* 1869. The Translators.
- Casey (J.) On Bicircular Quartics. 4to. *Dublin* 1869. The Author.
- Clarke (B.) A New Arrangement of Phanerogamous Plants. Oblong 4to. *London* 1866. Dr. John Millar.
- Edmonds (T. R.) On Vital Force, according to Age and the "English Life Table." 8vo. *London* 1869. The Author.
- Faugère (P.) Défense de B. Pascal et accessoirement de Newton, Galilée, Montesquieu, etc., contre les faux documents présentés par M. Chasles à l'Académie des Sciences. 4to. *Paris* 1868. The Author.
- James (Sir H., F.R.S.) Notes on the Great Pyramid of Egypt and the Cubits used in its design. 4to. *Southampton* 1869. The Author.
- Jones (T. Wharton, F.R.S.) Failure of Sight from Railway and other Injuries of the Spine and Head; its nature and treatment. 8vo. *London* 1869. The Author.

- Kops (J.) *Flora Batava*. Aff. 208–210. 4to. *Amsterdam*.
H.M. The King of the Netherlands.
- Lea (Isaac.) *Observations on the Genus Unio*. Vol. XII. 4to. *Philadelphia* 1869. The Author.
- Le Verrier (U. J., For. Mem. R.S.) *Annales de l'Observatoire Impérial de Paris*. Mémoires. Tome IX. 4to. *Paris* 1868. The Observatory.
- *Examen de la Discussion soulevée au sein de l'Académie des Sciences au sujet de la découverte de l'Attraction Universelle*. 4to. *Paris* 1869. The Author.
- Lubbock (Sir John, F.R.S.) *Prehistoric Times, as illustrated by Ancient Remains and the Manners and Customs of Modern Savages*. Second edition. 8vo. *London* 1869. The Author.
- Miller (Dr. W. A., Treas. R.S.) *Elements of Chemistry, theoretical and practical*. Fourth edition. Part 3. Organic Chemistry. 8vo. *London* 1869. The Author.
- Penrose (F. C.) *On a Method of predicting by graphical construction Occultations of Stars by the Moon, and Solar Eclipses for any given place*. 4to. *London* 1869. The Author.
- Quadri (Achille.) *Note alla Teoria Darwiniana*. 8vo. *Bologna* 1869.
Charles Darwin, F.R.S.
- Thomas (Lynall.) *The True Basis for the Construction of Heavy Artillery*. 8vo. *London* 1869. The Author.
- Willis (Rev. R., F.R.S.) *The Architectural History of the Conventual Buildings of the Monastery of Christ Church in Canterbury*. 8vo. *London* 1869. The Author.

- Royal Commission on Water Supply. *Report of the Commissioners*. Fol. *London* 1869. Dr. W. Pole, F.R.S.
- Six Photographs of the National Memorial to Sir John Franklin, in Waterloo Place, London, by M. Noble. M. Noble, Esq.
- Ordnance Survey of Jerusalem. Five Plans, in case. Folio 1865.
Sir H. James, F.R.S.

The following communication was in part read :—

- “ Preliminary Report of the Scientific Exploration of the Deep Sea in H.M. Surveying Vessel ‘Porcupine’ during the Summer of 1869, conducted by Dr. CARPENTER, V.P.R.S., Mr. J. GWYN JEFFREYS, F.R.S., and Prof. WYVILLE THOMSON, LL.D., F.R.S. Received November 18, 1869.

November 25, 1869.

Lieut.-General Sir EDWARD SABINE, President, K.C.B., in
the Chair.

In accordance with the Statutes, notice was given from the Chair of the
ensuing Anniversary Meeting, and the list of Officers and Council proposed
for election was read as follows :—

President.—Lieut.-General Sir Edward Sabine, R.A., K.C.B., D.C.L.,
LL.D.

Treasurer.—William Allen Miller, M.D., D.C.L., LL.D.

Secretaries.— { William Sharpey, M.D., LL.D.
George Gabriel Stokes, Esq., M.A., D.C.L., LL.D.

Foreign Secretary.—Prof. William Hallows Miller, M.A., LL.D.

Other Members of the Council.—Frederick Currey, Esq., M.A. ; Warren
De La Rue, Esq., Ph.D. ; Sir Philip de M. Grey Egerton, Bart. ; William
Henry Flower, Esq. ; William Huggins, Esq. ; John Gwyn Jeffreys, Esq. ;
John Marshall, Esq. ; Augustus Matthiessen, Esq., Ph.D. ; George Henry
Richards, Capt. R.N. ; The Marquis of Salisbury, M.A. ; Charles Wil-
liam Siemens, Esq. ; John Simon, Esq. ; Archibald Smith, Esq., M.A. ;
Prof. Henry J. Stephen Smith, M.A. ; Prof. John Tyndall, LL.D. ;
Prof. Alexander W. Williamson, Ph.D.

The following communication was read :—

“On the Action of Cyanogen on Anthranilic Acid.” By P. GRIESS,
F.R.S. Received June 29, 1869. (See page 89.)

The reading of the Preliminary Report by Dr. Carpenter, Mr. Gwyn
Jeffreys, and Dr. Wyville Thomson was resumed and concluded.

The contents of the Report will be given in a future Number.

The Presents received were laid on the Table, and thanks ordered for
them, as follows :—

Transactions.

Amsterdam :—Koninklijke Akademie van Wetenschappen. Verhande-
lingen. Afdeeling Letterkunde. Deel IV. 4to. *Amsterdam* 1869.
Verslagen en Mededeelingen. Afdeeling Natuurkunde. Tweede
Reeks. Deel III. 8vo. *Amsterdam* 1869. Jaarboek voor 1868.
8vo. *Amsterdam*. Processen-Verbaal van de gewone Vergade-
ringen. Afdeeling Natuurkunde, 1868–69. 8vo. *Amsterdam*.

The Academy.

Genootschap Natura Artis Magistra. Bijdragen tot de Dierkunde.

Afl. 9. 4to. *Amsterdam* 1869.

The Society.

Bologna :—Accademia delle Scienze dell' Istituto. Memorie. Serie 2.

Transactions (*continued*).

- Tomo VII., VIII. 4to. *Bologna* 1868–69. Rendiconto delle Sessioni 1867–68, 1868–69. 8vo. *Bologna* 1868–69. The Academy.
- Bombay :—Geographical Society. Transactions. From January 1865 to December 1867. Vol. XVIII. 8vo. *Bombay* 1868. The Society.
- London :—Clinical Society. Transactions. Vol. II. 8vo. *London* 1869. The Society.
- Royal Geographical Society. Journal. Vol. XXXVIII. 8vo. *London* 1868. Proceedings. Vol. XIII. Nos. 3–4. 8vo. *London* 1869. The Society.
- Saint Bartholomew's Hospital. Reports. Vol. V. 8vo. *London* 1869. The Hospital.
- Munich :—Kön. Bayerische Akademie der Wissenschaften. Abhandlungen. Math.-Phys. Classe: Band. X. Abth. 2. Hist. Classe: Band XI. Abth. 1. Philos.-Philol. Classe: Band. XI. Abth. 3. 4to. *München* 1868. Sitzungsberichte, 1869. I. Heft 1–3. 8vo. *München* 1869. Ueber die Entwicklung der Agriculturchemie. Festrede von August Vogel. 4to. *München* 1869. Denkschrift auf Carl Friedr. Phil. von Martius, von C. F. Meissner. 4to. *München* 1869. The Academy.
- Newcastle-upon-Tyne :—Natural-History Transactions of Northumberland and Durham. Part 1, Vol. III. 8vo. *London* 1869. The Tyneside Naturalists' Field Club.
- Stockholm :—Kongliga Vetenskaps-Akademie. Handlingar. Ny Följd Bandet V. Häftet 2; Bandet VI. Häftet 1–2; Bandet VII. Häftet 1. 4to. *Stockholm* 1864–67. Öfversigt af . . . Förhandlingar Årgångnen 22–25. 1865–68. 8vo. *Stockholm* 1866–69. Meteorologiska Jakttagelser i Sverige. Bandet VI., VII., VIII. 4to. *Stockholm* 1864–66. Kongliga Svenska Fregatten Eugenies Resa Omkring Jorden under befäl af C. A. Virgin åren 1851–53. Zoologi VI. 4to. *Stockholm* 1868. Lefnadsteckningar. Band I. Häfte 1. 8vo. *Stockholm* 1869. Igelström (L. I.), A. E. Nordenskiöld, and F. L. Ekman. On the existence of rocks containing Organic substances in the fundamental gneiss of Sweden. 8vo. *Stockholm*. Lindström (G.) Om Gotlands Nutida Mollusker. 8vo. *Wisby* 1868. Linnarsson (J. G. O.) On some fossils found in the Eophyton Sandstone at Lugnäs in Sweden. 8vo. *Stockholm* 1869. Lovén (S.) Om en märklig i Nordsjön lefvande art af Spongia. 8vo. *Stockholm* 1868. Nordenskiöld (A. E.) Sketch of the Geology of Spitzbergen. 8vo. *Stockholm* 1867. Stål (Carolus.) Hemiptera Africana. Tomi I.–IV. 8vo. *Holmiæ* 1864–66. Sundeval (C. J.) Conspectum Avium Picinarum. 8vo. *Stockholm* 1866. Die Thierarten des Aristoteles von den Klassen der Säugethiere, Vögel, Reptilien, und Insecten. 8vo. *Stockholm* 1863. The Academy.

- Coffin (M.) *Métaphysique du Calcul Différentiel*. 8vo. *Arras* 1869. The Author.
- Galton (F., F.R.S.) *Hereditary Genius: an Inquiry into its Laws and Consequences*. 8vo. *London* 1869. The Author.
- Gautier (—) *Notices Sommaires sur Divers Travaux, Rapports et Etablissements Astronomiques*. 8vo. *Genève*. The Author.
- Listing (J. B.) *Ueber eine Art stereoskopischer Wahrnehmung*. 12mo. *Göttingen* 1869. The Author.
- Zeitschrift für Biologie*, von L. Buhl, M. Pettenkofer, &c. Band II. Heft 2, 3; Band IV. Heft 2-4. 8vo. *München* 1866-69. The Editors.

November 30, 1869.

ANNIVERSARY MEETING.

Lieut.-General Sir EDWARD SABINE, K.C.B., President, in the Chair.

Dr. T. Graham Balfour, on the part of the Auditors of the Treasurer's Accounts appointed by the Society, reported that the total receipts during the past year, including a balance of £493 14s. 6d. carried from the preceding year, and the Oliveira and Davy bequests, amount to £6753 6s. 3d.; and that the total expenditure in the same period, including the Oliveira bequest on deposit, and the investment of the Davy bequest, amounts to £6429 1s. 8d., leaving a balance of £298 18s. 5d. at the Bankers, and of £25 6s. 2d. in the hands of the Treasurer.

The thanks of the Society were voted to the Treasurer and Auditors.

The Secretary read the following Lists:—

Fellows deceased since the last Anniversary.

On the Home List.

The Rev. Henry Hervey Baber, M.A.	John Hogg, Esq., M.A.
Arthur Kett Barclay, Esq.	Levett Landon Boscawen Ibbetson,
The Rev. John Barlow, M.A.	K.R.E. & H.
Sir John Peter Boileau, Bart.	Joseph Beete Jukes, Esq., M.A.
John Cam Hobhouse, Lord Brough-	Joseph Jackson Lister, Esq.
ton.	George Lowe, Esq.
William Clark, M.D.	Gilbert Wakefield Mackmurdo, Esq.
John Dickinson, Esq.	John Rogers, Esq.
William Fishburn Donkin, Esq.,	Peter Mark Roget, M.D.
M.A.	Sir James Emerson Tennent, Bart.,
Sir Henry Ellis, K.H.	LL.D.
James David Forbes, LL.D.	Lieut.-General Thomas Perronet
Thomas Graham, M.A., D.C.L.	Thompson, M.A.
Joseph Hodgson, Esq.	George Witt, Esq.

December 9, 1869.

Dr. WILLIAM ALLEN MILLER, Treasurer and Vice-President,
in the Chair.

It was announced from the Chair that the President had appointed the following Members of Council to be Vice-Presidents :—

The Treasurer.
Mr. De la Rue.
Sir Philip Egerton.
Capt. Richards.
Mr. Archibald Smith.

Dr. W. W. Gull was admitted into the Society.

The Presents received were laid on the Table, and thanks ordered for them, as follows :—

Transactions.

Albany :—State of New York. Fiftieth and Fifty-first Annual Reports of the Trustees of the State Library. Twentieth Annual Report of the Regents of the University on the Condition of the State Cabinet of Natural History. Report of Dr. Peters on the Longitude of the Western Boundary Line of the State of New York. 8vo. *New York* 1868–69. The Regents of the University.

Boston :—American Academy of Arts and Sciences. Proceedings. Vol. VII. Sheets 44–66. 8vo. *Boston* 1868. The Academy.

Boston Society of Natural History. Proceedings. Vol. XII. Sheets 1–17. Occasional Papers, I. (Entomological Correspondence of T. W. Harris.) 8vo. *Boston* 1868–69. The Society.

Breslau :—Schlesische Gesellschaft für vaterländische Cultur. Abhandlungen. Phil.-Hist. Abth. 1868. Heft II. 1869. Abth. für Naturwissenschaften und Medicin, 1868–69. Sechszundvierzigster Jahresbericht. 8vo. *Breslau* 1869. The Society.

Cambridge, Mass. :—American Association for the Advancement of Science. Proceedings. Sixteenth Meeting held at Burlington, Vermont, August 1867. 8vo. *Cambridge* 1868. The Association.

Harvard College. Forty-Second Annual Report of the President for the year 1867–68. Treasurer's Statement, 1868. Report of the Board of Overseers, 1869. A Catalogue of the Officers and Students for the year 1868–69. The New Catalogue of Harvard College Library, and other papers. 8vo. The College.

Museum of Comparative Zoology. Annual Report of the Trustees, 1868. Bulletin, pp. 121–142. 8vo. *Boston and Cambridge* 1868–69. The Museum.

Caracas :—Sociedad de Ciencias Físicas y Naturales. Vargasia : Boletín

Transactions (*continued*).

- de la Sociedad. Num. 1-4. El Lago de Asfalto en la Isla de Trinidad, por A. Rojas. La Sumergida Isla de Atlantis, por el Dr. F. Unger, traducido por G. A. Ernst. Rede gehalten am Abend der Vorfeier des Humboldt-Festes 13. Sept. 1869 in der Ruine von Saboura Grande, von A. Ernst. 8vo. *Cardacas* 1867-69.
- The Society.
 London:—Geological Survey of Great Britain. Memoirs. Reports on the Geology of Jamaica, by J. S. Sawkins. The Geology of the Carboniferous Limestone, Yoredale Rocks, and Millstone Grit of North Derbyshire and the adjoining parts of Yorkshire. The Triassic and Permian Rocks of the Midland Counties of England, by E. Hull. The Geology of part of the Yorkshire Coal-field. Mineral Statistics for 1868, by R. Hunt. Catalogue of the published Maps, Sections, Memoirs, and other Publications. 8vo. *London* 1869.
- The Survey.
 Royal Medical and Chirurgical Society. Medico Chirurgical Transactions. Vol. LII. 8vo. *London* 1869. The Society.
 New York. Lyceum of Natural History. Annals. Vol. IX. Nos. 1-4. 8vo. *New York* 1868. The Lyceum.
 United States Sanitary Commission. A Sketch of its purposes and its work. 12mo. *Boston* 1863. A Succinct Narrative of its works and purposes. 8vo. *New York* 1864. History of the Commission, by C. J. Stillé. 8vo. *New York* 1868. Memoirs, Statistical. 8vo. *New York* 1869. History of the Brooklyn and Long Island Fair, Feb. 22, 1864. 8vo. *Brooklyn* 1864. Memoir of the Great Central Fair held at Philadelphia, June 1864, by C. J. Stillé. 4to. *Philadelphia* 1864. A Record of the Metropolitan Fair held at New York in April 1864. 4to. *New York* 1867. The Commission.
 Philadelphia:—Forty-Ninth Annual Report of the Board of Controllers of Public Schools of the First School District of Penn'a for the year ending Dec. 31, 1867. 8vo. *Philadelphia* 1868. The Board.
 American Philosophical Society. Proceedings. Vol. X. Nos. 78-80. 8vo. *Philadelphia* 1867-68. The Society.
 Pisa:—Memorie Valdarnesi. Vol. I.-IV. 8vo. *Pisa* 1835-55. C. Falconer, Esq.
 San Francisco:—California Academy of Sciences. Proceedings. Vol. IV. Part 1. 8vo. *San Francisco* 1869. The Academy.
 Toulouse:—Académie Impériale des Sciences, Inscriptions et Belles-Lettres. Mémoires. 7^e série, Tome I. 8vo. *Toulouse* 1869. The Academy.
 Washington:—National Academy of Sciences. Letters of the President and Vice-President, 1867-68. 8vo. *Washington*. The Academy.
 Smithsonian Institution. Annual Report of the Board of Regents for the year 1867. 8vo. *Washington* 1868. The Institution.

- Chase (P. E.) Some Remarks on the Fall of Rain, as affected by the Moon. On some General Connotations of Magnetism. 8vo. *Philadelphia* 1868. The Author.
- Hugueny (F.) Le Coup de Foudre de l'Ile du Rhin près de Strasbourg (13 Juillet, 1869). 4to. *Strasbourg* 1869. The Author.
- Lea (Isaac) Descriptions of Twelve New Species of *Unionidæ* from South America. Notes on some Members of the Feldspar Family &c. 8vo. *Philadelphia* 1868. The Author.
- Rees (G. Owen, F.R.S.) The Harveian Oration delivered at the Royal College of Physicians, June 26, 1869. 12mo. *London* 1869. The Author.
- Smiles (R.) Memoir of the late Henry Booth, of the Liverpool and Manchester, and afterwards of the London and North-Western Railway. 8vo. *London* 1869. Miss Booth.
- Tuson (R. V.) A Pharmacopœia, including the Outlines of Materia Medica and Therapeutics, for the use of Practitioners and Students of Veterinary Medicine. 12mo. *London* 1869. The Author.

The following communications were read :—

- I. "Spectroscopic Observations of the Sun."—No. V. By J. NORMAN LOCKYER, F.R.S. Received July 8, 1869. (See p. 74.)
- II. "Researches on Gaseous Spectra in relation to the Physical Constitution of the Sun, Stars, and Nebulæ."—Third Note. By E. FRANKLAND, F.R.S., and J. NORMAN LOCKYER, F.R.S. Received July 14, 1869. (See p. 79.)
- III. "On the successive Action of Sodium and Iodide of Ethyl on Acetic Ether." By J. ALFRED WANKLYN, F.C.S. &c. Communicated by Professor WILLIAMSON. Received July 16, 1869. (See p. 91.)
- IV. "On Linear Differential Equations." By W. H. L. RUSSELL, F.R.S. Received November 13, 1869.

The condition that the linear differential equation

$$(\alpha + \beta x + \gamma x^2) \frac{d^2 u}{dx^2} + (\alpha' + \beta' x + \gamma' x^2) \frac{du}{dx} + (\alpha'' + \beta'' x + \gamma'' x^2) u = 0$$

admits of an integral $u = e^{\int \phi dx}$, where ϕ is a rational function of (x) , is given by the system of equations

$$\begin{vmatrix} \cdot & \cdot & \cdot & \cdot & \cdot & \cdot & \cdot & \cdot & \cdot & \cdot \\ 0 \dots P_{r-1} & Q_{r-1} & R_{r-1} & S_{r-1} & 0 & 0 & \dots & 0 \\ 0 \dots 0 & P_r & Q_r & R_r & S_r & 0 & \dots & 0 \\ 0 \dots 0 & 0 & P_{r+1} & Q_{r+1} & R_{r+1} & S_{r+1} & \dots & 0 \\ \cdot & \cdot & \cdot & \cdot & \cdot & \cdot & \cdot & \cdot \end{vmatrix} = 0$$

where P_r, Q_r, R_r, S_r are given as follows.

December 16, 1869.

Lieut.-General Sir EDWARD SABINE, K.C.B., President, in
the Chair.

Mr. Charles Chambers was admitted into the Society.

Pursuant to notice given at the last Meeting, General Sir Andrew
Waugh proposed, and General Boileau seconded the Right Honourable
Lord Napier of Magdala for election and immediate ballot.

The ballot having been taken, Lord Napier was declared duly elected.

The Presents received were laid on the Table, and thanks ordered for
them, as follows :—

Transactions.

Bordeaux :—Société Médico-Chirurgicale des Hopitaux et Hospices.
Mémoires et Bulletins. Tome III. fasc. 2. 8vo. *Bordeaux* 1868.

The Society.

Calcutta :—Asiatic Society of Bengal. Journal, 1869. Part 2. No. 2.
Proceedings, 1869. Nos. 2, 3, 5, 8. 8vo. *Calcutta* 1869.

The Society.

Cambridge :—Philosophical Society. Proceedings. Nos. 1–2. 8vo. *Cam-*
bridge 1866.

The Society.

Innsbruck :—Ferdinandeam für Tirol und Vorarlberg. Zeitschrift. Dritte
Folge. Heft 14. 8vo. *Innsbruck* 1869.

The Institution.

Jena :—Medicinisch-Naturwissenschaftliche Gesellschaft. Jenaische
Zeitschrift für Medicin und Naturwissenschaft. Band V. Heft 1–2.
8vo. *Leipzig* 1869.

The Society.

Leipzig :—Resultate aus den Meteorologischen Beobachtungen angestellt
an den fünfundwanzig Königl. Sächsischen Stationen im Jahre
1867 . . . von C. Bruhns. Jahrgang IV. 4to. *Leipzig* 1869.

The Observatory.

London :—Mathematical Society. Proceedings. Nos. 16–19. 8vo.
London 1868–69.

The Society.

Royal Institution of Great Britain. Proceedings. Vol. V. Part 6.
No. 50. List of the Members, with the Report of the Visitors.
8vo. *London* 1869.

The Institution.

Royal Geographical Society. Proceedings. Vol. XIII. No. 5. 8vo.
London 1869.

The Society.

Modena :—Società dei Naturalisti. Annuario. Anno 4. 8vo. *Modena*
1869.

The Society.

Prag :—K. K. Sternwarte. Magnetische und Meteorologische Beobach-
tungen . . . im Jahre 1868 von K. Hornstein und A. Murmann.
Jahrgang 29. 4to. *Prag* 1869.

The Observatory.

Vienna :—K. K. Central-Anstalt für Meteorologie und Erdmagnetismus.

Transactions (*continued*).

- Jahrbücher von C. Jelinek und C. Fritsch. Neue Folge. Band III. Jahrgang 1866. 4to. *Wien* 1868. The Institution.
- K. K. Geographische Gesellschaft. Mittheilungen. Jahrgang 10. Neue Folge. Band II. 8vo. *Wien* 1868-69. The Society.
-
- Baratta (G.) Studio Geometrico sulla Variazione e paragone degli Angoli fondato su nuovi teoremi e problemi che ne derivano. 8vo. *Napoli* 1869. The Author.
- Battye (R. F.) Upon certain important Matters in relation to the Areas of Circles and Squares, a Geometrical Brochure. 8vo. *London* 1869. The Author.
- Dirks (H.) The Policy of a Patent Law. 8vo. *London* 1869. The Author.
- Dove (H. W., For. Mem. R. S.) Nicht periodische Veränderungen der Verbreitung der Wärme auf der Erdoberfläche. 8vo. *Berlin* 1869. The Author.
- Favre (E.) Description des Mollusques Fossiles de la Craie de Lemberg en Galicie. 4to. *Genève* 1869. The Author.
- Francesco (B.) Catalogo dei Fossili Miocenici e Pliocenici del Modenese. 8vo. *Modena* 1869. L'Uomo fatto ad imagine di Dio fu anche fatto ad imagine della Scimia. 8vo. *Cagliari* 1869. The Author.
- Günther (R.) Die Indische Cholera im Regierungsbezirke Zwickau im Jahre 1866. 4to. *Leipzig* 1869. The Author.
- Huguet (H. A. B.) Exposé de Médecine Homœodynamique basée sur la loi de similitude fonctionnelle et appliquée au traitement des Affections aiguës et Chroniques. 12mo. *Paris* 1869. The Author.
- Lawes (J. B., F.R.S.) and Gilbert (J. H., F.R.S.) On the Home Produce, Imports, and Consumption of Wheat. 8vo. *London* 1868. The Authors.
- Linder (M.) Note sur les Variations Séculaires du Magnétisme Terrestre. 8vo. *Bordeaux* 1869. The Author.
- Mühry (A.) Ueber die Lehre von den Meeresströmungen. 8vo. *Göttingen* 1869. Untersuchungen über die Theorie und das allgemeine geographische System der Winde. 8vo. *Göttingen* 1869. The Author.
- Pictet (F. J.) Mémoire sur les Animaux Vertébrés trouvés dans le Terrain Sidérolithique du Canton de Vaud; Supplément. 4to. *Genève* 1869. The Author.
- Reade (Rev. J. B., F.R.S.) The Diatom Prism and the true form of Diatom Markings, and the Microscope Prism and the Structure of the Podura Scale. 8vo. *London* 1869. The Author.
- Sylvester (J. J., F.R.S.) Outline Trace of the Theory of Reducible Cyclodes. 8vo. *London* 1869. The Author.
- Williamson (A. W., F.R.S.) On the Atomic Theory. 8vo. *London* 1869. The Author.

- Du Mouvement Politique en France depuis 1789 jusqu'à nos jours. 8vo. *Toulon* 1869. The Author.
- The Mortality Experience of Life Assurance Companies, collected by the Institute of Actuaries. 8vo. *London* 1869. The Institute.
- The New System of Astronomy ; or, is the Earth a Fixed Star or Planet ? 8vo. *London* 1869. The Author.
- The True Theory of the Earth, and Philosophy of the Predicted End. 8vo. *Edinburgh* 1869. The Author.

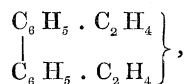
The following communications were read :—

- I. "Researches into the Constitution of the Opium Bases.—Part III. On the Action of Hydrochloric Acid on Codeia." By AUGUSTUS MATTHIESSEN, F.R.S., Lecturer on Chemistry in St. Bartholomew's Hospital, and C. R. A. WRIGHT, B.Sc. Received July 23, 1869. (See p. 83.)
- II. "On the Thermodynamic Theory of Waves of Finite Longitudinal Disturbance:" and Supplement. By W. J. MACQUORN RANKINE, C.E., LL.D., F.R.SS. Lond. & Edinb. Received August 13, 1869. (See p. 80.)
- III. "On Abstract Geometry." By Professor CAYLEY. Received October 14, 1869.
(Abstract.)

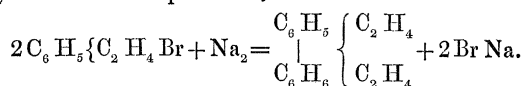
I submit to the Society the present exposition of some of the elementary principles of an Abstract m -dimensional geometry. The science presents itself in two ways,—as a legitimate extension of the ordinary two- and three-dimensional geometries ; and as a need in these geometries and in analysis generally. In fact whenever we are concerned with quantities connected together in any manner, and which are, or are considered as variable or determinable, then the nature of the relation between the quantities is frequently rendered more intelligible by regarding them (if only two or three in number) as the coordinates of a point in a plane or in space ; for more than three quantities there is, from the greater complexity of the case, the greater need of such a representation ; but this can only be obtained by means of the notion of a space of the proper dimensionality ; and to use such representation, we require the geometry of such space. An important instance in plane geometry has actually presented itself in the question of the determination of the curves which satisfy given conditions : the conditions imply relations between the coefficients in the equation of the curve ; and for the better understanding of these relations it was expedient to consider the coefficients as the coördinates of a point in a space of the proper dimensionality.

A fundamental notion in the general theory presents itself, slightly in

current of carbonic anhydride sent through the mixture. Not the slightest reaction was perceptible in the cold. The sodium remained perfectly metallic-looking, even after the expiration of twenty-four hours. On gently heating the liquid for a few minutes, a vigorous reaction at once set in; the mass became suddenly very hot, and gave off abundant fumes of hydrobromic acid and a small quantity of a thick oily liquid boiling at a high temperature, and possessing the character of the distyrol,yl,



described by Berthelot was produced,



The Society then adjourned over the Christmas Recess to Thursday, January 6th, 1870.

January 6, 1870.

Lieut.-General Sir EDWARD SABINE, K.C.B., President, in the Chair.

The Presents received were laid on the Table, and thanks ordered for them, as follows:—

Transactions.

- Birmingham :—Institution of Mechanical Engineers. Proceedings, 1868, 28, 29 July. Leeds Meeting, Part 3, Nov. 5; 1869, April 29. 8vo. *Birmingham*. The Institution.
- Cadiz :—Observatorio de Marina de la Ciudad de San Fernando. Almanaque Nautico para 1871. 8vo. *Cadiz*, 1869. The Observatory.
- Cherbourg :—Société Impériale des Sciences Naturelles. Mémoires. Tome XIII. 8vo. *Paris* 1868. The Society.
- Coimbra :—Observatorio da Universidade. Ephemeris Astronomicas para o anno de 1871. 8vo. *Coimbra* 1869. The Observatory.
- Danzig :—Naturforschende Gesellschaft. Schriften, neue Folge. Band II. Heft II. 8vo. *Danzig* 1869. Two copies (one with Photographs). The Society.
- Habana :—Colegio de Belen. Observaciones Magneticas y Meteorológicas. Año Meteorológico de 30 de Noviembre de 1867, a 30 de Noviembre de 1868. 8vo. *Habana* 1869. The College.
- London :—British Museum. Hand-List of Genera and Species of Birds, by G. R. Gray. Part I. 8vo. *London* 1869. Catalogue of the Specimens of *Dermoptera Saltatoria*, by F. Walker. Part 2. 8vo. *London* 1869. Guides to the First and Second Vase Rooms. 12mo. *London*

Transactions (*continued*).

1869. Guide to the Printed Books. 12mo. *London* 1869. A
Guide to the Slade Collection of Prints. 12mo. *London* 1869.

The Museum.

The Nautical Almanac and Astronomical Ephemeris for 1873. 8vo.
London 1869. The Admiralty.

Melbourne :—Williamstown Observatory. Astronomical Observations
made in the years 1861, 1862, and 1863, under the direction of
R. L. J. Ellery. 8vo. *Melbourne* 1869. The Observatory.

Moscow :—Société Impériale des Naturalistes. Bulletin, Année 1868,
Nos. 3, 4. 8vo. *Moscou* 1869. The Society.

Paris :—Observatoire Impérial. Atlas Météorologique. Années 1867,
1868. fol. *Paris* 1869. Atlas des Mouvements généraux de l'At-
mosphère. Année 1865, Janv.—Juin 1869. fol. *Paris* 1869.

The Observatory.

Société Météorologique de France. Nouvelles Météorologiques. 1869,
Nos. 7–12. roy. 8vo. *Paris* 1869. The Society.

Pulkowa :—Observations de Poulkova, publiées par Otto Struve. Vol.
I., II. 4to. *St. Pétersbourg* 1869. Jahresbericht am 5. Juni 1869
dem Comité der Nicolai-Hauptsternwarte. 8vo. *St. Petersburg* 1869.
Tabulæ Quantitatum Besselianarum pro annis 1750 ad 1840 com-
putatæ. 8vo. *Petropoli* 1869. The Observatory.

St. Petersburg :—Observatoire Physique Central de Russie. Annales,
publiées par H. Wild. 4to. *St. Pétersbourg* 1869. The Observatory.

Bertin (E.) Étude sur la Houle et le Roulis. 8vo. *Cherbourg* 1869.

The Author.

Durdik (J.) Leibnitz und Newton. Ein Versuch über die Ursachen der
Welt auf Grundlage der positiven Ergebnisse der Philosophie und
der Naturforschung. 8vo. *Halle* 1869. The Author.

Kronecker (L.) Ueber Systeme von Functionen mehrerer Variablen. 8vo.
Berlin 1869. The Author

Kudelka (J.) Die Gesetze der Lichtbrechung. 8vo. *Greifswald*.

The Author.

Mueller (F. de, F.R.S.) Fragmenta Phytographiæ Australiæ. Vol. VI.
8vo. *Melbourne* 1867–68. The Author.

Plantamour (E.) Résumé Météorologique de l'Année 1868 pour Genève
et le Grand St.-Bernard. 8vo. *Genève* 1869. The Author.

Turbiglio (S.) L'Empire de la Logique, Essai d'un nouveau système de
Philosophie. 12mo. *Turin* 1870. The Author.

L'Album de la Fabrique. Troisième Année, 1869. fol. *Paris*.

Messrs. L. Berger & Co.

16 ft. only could pass. In the Bitter Lakes the depth was seldom below 28 ft., often above 30 ft.; and the same may be said of the canal between the Bitter Lakes and the Red Sea at Suez. On each side of the deep part in the centre the depth was generally about 12 or 13 ft.

Where the slopes are unprotected by stone, and the natural soil is sandy, the sides, notwithstanding the flat slope, were a good deal washed when a paddle-wheel steamer (the 'Delta,' P. & O. 1600 tons) advanced at seven or eight miles an hour; but comparatively little effect was produced when the speed did not exceed five or six miles an hour.

Two large vessels will find it difficult to pass each other; but "lie-by" or passing-places are being constructed to remedy this inconvenience.

J. F. B.

January 13, 1870.

WARREN DE LA RUE, Vice-President, in the Chair.

The Presents received were laid on the Table, and thanks ordered for them, as follows:—

Transactions.

- Basel :—Naturforschende Gesellschaft. Verhandlungen. Theil V. Heft 2.
8vo. *Basel* 1869. The Society.
- Bern :—Naturforschende Gesellschaft. Mittheilungen, aus dem Jahre 1868.
No. 654–683. 8vo. *Bern* 1869. The Society.
- Brussels :—Académie Royale de Médecine. Mémoires. Tome V. Fasc. 1.
4to. *Bruxelles* 1869. Bulletin. 3^e série, Tome II. No. 10; Tome III.
Nos. 5–10. 8vo. *Bruxelles* 1868–69. The Academy.
- Buenos Aires :—Museo Publico. Anales, por German Burmeister. Entrega 6. 4to. *Buenos Aires* 1869. The Museum.
- Einsiedeln :—Schweizerische Naturforschende Gesellschaft. Verhandlungen. Jahresbericht 1868. 8vo. *Einsiedeln*. The Society.
- Geneva :—Société de Physique et d'Histoire Naturelle. Mémoires. Tome XX. Partie 1. 4to. *Genève* 1869. The Society.
- Göttingen :—Königl. Sternwarte. Astronomische Mittheilungen. Theil I. 4to. *Göttingen* 1869. The Royal Society of Göttingen.
- Graz :—Naturwissenschaftlicher Verein für Steiermark. Mittheilungen. Band II. Heft 1. 8vo. *Graz* 1869. The Society.
- Haarlem :—Musée Teyler. Archives. Vol. II. Fasc. 3. roy. 8vo. *Haarlem* 1869. The Museum.
- London :—Quekett Microscopical Club. Journal. Nos. 7–9. Fourth Report. 8vo. *London* 1869–70. The Club.
- Utrecht :—Provinciaal Utrechtsch Genootschap van Kunsten en Wetenschappen. Natuurkundige Verhandelingen. Nieuwe Reeks. Deel I.

Transactions (*continued*).

- Stuk 6. 4to. *Utrecht* 1869. Verslag van het Verhandelde in de algemeene Vergadering ... gehouden den 29. Juni 1869. 8vo. *Utrecht* 1869. Aanteekeningen van het Verhandelde in de Sectie-Vergaderingen. 8vo. *Utrecht* 1869. The Society.
- Vienna :—K. Akademie der Wissenschaften. Sitzungsberichte. Math.-Naturw. Classe : Erste Abth. Band LVIII. Hefte 1-5 ; Band LIX. Hefte 1, 2. Zweite Abth. Band LVIII. Hefte 2-5 ; Band LIX. Hefte 1-3. Phil.-Hist. Classe. Band LX. Hefte 1-3 ; Band LXI. Heft 1. Register zu den Bänden 51-60. 8vo. *Wien* 1868-69. Tabulæ Codicum Manu Scriptorum præter Græcos et Orientales in Bibliotheca Palatina Vindobonensi asservatorum. Vol. III. 8vo. *Vindobonæ* 1869. Die Porphyrgesteine Österreichs aus der mittleren geologischen Epoche, von Dr. G. Tschermak. 8vo. *Wien* 1869. The Academy
-
- Bellucci (G.) Sull' Ozono, Note e Riflessioni. 8vo. *Prato* 1869. The Author, by Dr. Tyndall, F.R.S.
- Duncan (P. M., F.R.S.) First Report on the British Fossil Corals. 8vo *London* 1868. The Author.
- Hanbury (D., F.R.S.) Historical Notes on Manna. 8vo. *London* 1869. The Author
- Hill (M. D.) Is Allegiance by Birth affected in England by Naturalization in France? Opinions of M. Cremieux, M. Bonneville de Marsangy, of Lord Campbell, and of Lord Brougham. 8vo. *Bristol* 1869. The Author.
- Lankester (E., F.R.S.) Sixth Annual Report of the Coroner for the Central District of Middlesex. 8vo. *London* 1869. The Author.
- Leymerie (A.) Catalogue des Travaux Géologiques et Minéralogiques publiés jusqu'en 1870. 8vo. *Paris* 1869. The Author.
- Littrow (C. von.) Ueber das Zurückbleiben der Alten in den Naturwissenschaften. 8vo. *Wien* 1869. The Author.
- Newmarch (W., F.R.S.) Inaugural Address. Statistical Society, Nov. 16, 1869. 8vo. *London* 1869. The Author.
- Roussillon (Duc du) Origines, Migrations, Philologie et Monuments Antiques. Vol. I. Partie 1, 2. 8vo. *Londres* 1867. The Author.
- Zöllner (J. C. F.) Ueber ein neues Spectroskop nebst Beiträgen zur Spectralanalyse der Gesteine. Beobachtungen von Protuberanzen der Sonne. Astrophysik. 8vo. *Leipzig* 1868. The Author.

The following communications were read :—

that the star Arcturus does give us more heat than α Lyræ,—a result probably due to the same cause which gives rise to the difference in colour between these stars, viz. the greater absorption of the red end of the spectrum in the case of α Lyræ than in the case of Arcturus.

I may here mention that on June 25, 1869, I made a direct comparison between Arcturus and α Lyræ. The result gave for the heat received from Arcturus : that from α Lyræ : : 3 : 2 ; but on account of the observations of α Lyræ having been interrupted by cloud, they were not sufficiently numerous to eliminate mere errors of reading.

From the whole of these observations I think we may conclude that Arcturus gives to us considerably more heat than α Lyræ ; that the amount of heat received is diminished very rapidly as the amount of moisture in the air increases ; that nearly the whole heat is intercepted by the slightest cloud ; that as first approximations, the heat from Arcturus, at an altitude of 25° , at Greenwich is about equal to that from a three-inch cube containing boiling water at a distance of 400 yards.

The heat from α Lyræ at an altitude of 60° is about equal to that from the same cube at a distance of about 600 yards. The form given to the pile appears likely to be useful in many inquiries respecting differences of heating-power.

January 20, 1870.

Dr. WILLIAM ALLEN MILLER, Treasurer and Vice-President,
in the Chair.

The Presents received were laid on the Table, and thanks ordered for them, as follows :—

Transactions.

Christiania :—Kongelige Norske Frederiks Universitet. Aarsberetning for Aaret 1868. 8vo. *Christiania* 1869. Index Scholarum, 1869. 4to. *Christiania* 1869. Forhandlinger i Videnskabs-Selskabet i Christiania, Aar 1868. 8vo. *Christiania* 1869. Forhandlinger ved de Skandinaviske Naturforskeres, tiende Møde i Christiania fra den 4^{de} til den 10^{de} Juli 1868. 8vo. *Christiania* 1869. Nyt Magazin for Naturvidenskaberne. Bind I. Heft 1, 1835 (1869) ; Bind XVI. 8vo. *Christiania* 1869. Anton Rosing, Biographie, par P. Chr. Asbjørnsen. 8vo. *Christiania* 1869. La Norvège Littéraire, par P. Botten-Hansen. 8vo. *Christiania* 1868. Traité Élémentaire des Fonctions Elliptiques, par O. J. Broch. 8vo. *Christiania* 1867. Quellen zur Geschichte der Taufsymbole und der Glaubensregel von C. P. Caspari. II. 8vo. *Christiania* 1869. Micro-metric Examination of Stellar Cluster in Perseus, by O. A. L. Phil. 4to. *Christiania* 1869. Skolevæsenets Ordning i Massachusetts, af H. Rissen. 8vo. *Christiania* 1868. Le Glacier de Boium en Juillet

Transactions (*continued*).

- 1868, par S. A. Sexe. 4to. *Christiania* 1869. Anatomisk Beskrivelse af Bursæ Mucosæ, af A. S. D. Synnestvedt. 4to. *Christiania* 1869. The University.
- Norske Meteorologiske Institut. Norsk Meteorologisk Aarbog for 1868, 2^{den} Aargang. 4to. *Christiania* 1869. The Institute.
- Coimbra:—Universidade. Annuario 1869–70. 12mo. *Coimbra* 1869. The University.
- Dublin:—Royal Dublin Society. Journal. No. 37. 8vo. *Dublin* 1868. The Society.
- Royal Geological Society of Ireland. Journal. Vol. II. Part 1. 8vo. *Dublin* 1868. The Society.
- Edinburgh:—Royal Scottish Society of Arts. Transactions. Vol. VIII. Part 1. 8vo. *Edinburgh* 1869. The Society.
- Emden:—Naturforschende Gesellschaft. Jahresberichte 1858–68, 44–54. 8vo. *Emden* 1859–69. The Society.
- Haarlem:—Société Hollandaise des Sciences. Archives Néerlandaises des Sciences Exactes et Naturelles. Tome IV. 8vo. *La Haye* 1869. The Society.
- London:—Royal Asiatic Society. Journal. New series. Vol. IV. Part 1. 8vo. *London* 1869. The Society.
- Thronhjøm:—Kongelige Norske Videnskabers Selskabs-Skrifter i det 19de Aarhundrede. Bind V. Heft 2. 8vo. *Thronhjøm* 1865–68. The Society.
- Vienna:—K. K. Sternwarte. Annalen, von C. von Littrow. Dritter Folge. Band XV. Jahrgang 1865. 8vo. *Wien* 1869. The Observatory.

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- Galton (Douglas, F.R.S.) An Address on the general principles which should be observed in the Construction of Hospitals. 8vo. *London* 1869. The Author.
- Palombo (E.) Della Proprietà e degli Ordinamenti Sociali, studi storico-economici. 8vo. *Napoli* 1869. The Author.
- Townsend (R., F.R.S.) On the Nodal Cones of Quadrimodal Cubics, and the Zomal Conics of Tetrazomal Quartics. 8vo. *London* 1869. The Author.

The following communications were read:—

- I. "On the Mechanical Performance of Logical Inference." By W. STANLEY JEVS, M.A. (Lond.), Professor of Logic &c. in Owens College. Communicated by Professor E. Roscoe. Received October 16, 1869.

(Abstract.)

It is remarkable that from the earliest times mechanical assistance has been employed in mathematical computation. The use of pebbles, of the

may be termed the equator of the solar motion; that is, the great circle having the apex of the sun's motion as a pole. This circumstance points to that remarkable cluster, rather than to the Pleiades, as the centre of the sidereal system, if, indeed, that system have a centre cognizable by us. When we remember that for every fixed star in the Pleiades there are hundreds in the great cluster in Perseus, the latter will seem the worthier region to be the centre of motion. I should be disposed, however, to regard the cluster in Perseus as the centre of a portion of the sidereal system, rather than as the common centre of the Galaxy.

The peculiarities of the apparent proper motions of the stars seem to me to lend a new interest to the researches which Mr. Huggins is preparing to make into the stellar proper motions of recess or approach.

III. "On Jacobi's Theorem respecting the relative Equilibrium of a Revolving Ellipsoid of Fluid; and on Ivory's Discussion of the Theorem." By I. TODHUNTER, M.A., F.R.S., late Fellow of St. John's College, Cambridge. Received November 23, 1869.

(Abstract.)

Jacobi discovered the theorem that a fluid ellipsoid revolving with uniform angular velocity round its least axis might be in equilibrium. Ivory discussed the theorem, and made several statements regarding the limitations of the proportions of the axis. Ivory's statements contain various errors and truths based on erroneous reasoning. The object of the present memoir is to correct Ivory's errors, to supply his imperfections, and to add something to what is already known respecting the theorem.

January 27, 1870.

ARCHIBALD SMITH, M.A., Vice-President, in the Chair.

Professor Wyville Thomson was admitted into the Society.

The Presents received were laid on the Table, and thanks ordered for them, as follows:—

Transactions:—

Cambridge, Mass.:—Museum of Comparative Zoology. Bulletin. Nos. 8–13. 8vo. *Cambridge* 1869. The Museum.

Copenhagen:—Kongelige Danske Videnskabernes Selskab. Skrifter, Nat. og Math. Afd. Bd. VIII. 1, 3, 4, 5. 4to. *Kjöbenhavn* 1868–69. Oversigt, 1868, No. 5; 1869, No. 2. 8vo. *Kjöbenhavn* 1868–69.

The Society.

Transactions (*continued*).

- Frankfurt a. M.:—Senckenbergische Naturforschende Gesellschaft. Abhandlungen. Band VII. Hefte 1–2. 4to. *Frankfurt* 1869. Bericht von Juni 1868 bis Juni 1869. 8vo. The Society.
- Leipzig:—Astronomische Gesellschaft. Vierteljahrsschrift. IV. Jahrgang. Hefte 2–3. 8vo. *Leipzig* 1869. Publication IX. (Tafeln der Pomona.) 4to. *Leipzig* 1869. The Society.
- Neuchâtel:—Société des Sciences Naturelles. Bulletin. Tome VIII. cahier 1. 8vo. *Neuchâtel* 1868. The Society.
- Philadelphia:—Franklin Institute. Journal. Third Series. Vol. LVIII. Nos. 1–6. 8vo. *Philadelphia* 1869. The Institute.
-
- Agassiz (L., For. Mem. R.S.) Report upon Deep-Sea Dredgings. 8vo. *Cambridge [Mass.]*. Address delivered on the Centennial Anniversary of the birth of Alexander von Humboldt, under the auspices of the Boston Society of Natural History. 8vo. *Boston* 1869. The Author.
- Campani (G.) Azione del Permanganato di Potassio sull'Asparagina. 8vo. *Siena* 1869. The Author.
- Clark (F. Le Gros) Lectures on the Principles of Surgical Diagnosis, especially in relation to Shock and Visceral Lesions. 8vo. *London* 1870. The Author.
- Joly (N.) Haute Antiquité du Genre Humain. 8vo. *Toulouse* 1869. The Author.
- Pole (Dr., F.R.S.) On Probabilities as illustrated by events occurring in Games with Cards. 12mo. *London* 1869. The Author.
- Realis (S.) Note sur le Nombre *e*. 8vo. *Paris* 1869. The Author.
- Rüttimeyer (L.) Ueber Thal- und See-Bildung. 4to. *Basel* 1869. The Author.
- Stainton (H. T., F.R.S.) The Tineina of Southern Europe. 8vo. *London* 1869. The Entomologist's Annual for 1870. 12mo. *London* 1870. The Author.
- Sundby (Thor) Brunetto Latinos Levnet og Skrifter. 8vo. *Kjöbenhavn* 1869. The Author.
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- Catalogue of Books added to the Library of Congress, from Dec. 1, 1867 to Dec. 1, 1868. roy. 8vo. *Washington* 1869. The Library.
- Statistics of New Zealand for 1868. fol. *Wellington* 1869. The Registrar-General of New Zealand.
-
- Archivio per la Zoologia, l'Anatomia e la Fisiologia, pubblicato per cura dei Proff. S. Richiardi e G. Canestrini. Serie 2, Vol. I. 8vo. *Torino* 1869. The Editors.
- Der Zoologische Garten, X. Jahrgang, No. 1–12. 8vo. *Frankfurt a. M.* 1869. The Zoological Society of Frankfurt.

Melbourne:—Flagstaff Observatory. Meteorological Observations, 1857–58. 2 vols. sm. fol. Daily Meteorological Register, 1859–1863. 5 vols. fol. Original Observations on Atmospheric Electricity, 1858. sm. fol. Daily Electrical Register, 1860–63. 3 vols. 4to. Magnetical Observations, 1st May to 31st Dec. 1858. sm. fol. Remarks and Disturbance Observations during the year 1859. Daily Magnetical Register, 1860–62, and Jan. to Feb. 1863. 3 vols. sm. fol. MSS. Presented by the Observer, Dr. Neumayer.

The following communications were read:—

- I. "Observations on the Temperature of the Strata taken during the sinking of the Rose Bridge Colliery, Wigan, Lancashire, 1868–69." By EDWARD HULL, M.A., F.R.S., Director of the Geological Survey of Ireland. Received November 27, 1869.

In an elaborate paper by Mr. W. Hopkins, F.R.S., entitled "Experimental Researches on the Conductive Powers of various Substances," published in the Philosophical Transactions for 1857, an account is given of a series of experiments made under the general supervision of Mr. Hopkins himself and Mr. W. Fairbairn, F.R.S., during the sinking of the Astley Pit of Dukenfield Colliery in Cheshire*. At the time this paper was written the depth attained was only a little more than 1400 feet; and the rate of increase between the depths of 700 feet and 1330 feet was found to be 1° F. for about 65 feet. These observations were subsequently continued until the pits had attained their full depth of 717 yards from the surface. The last observation made was in the shale overlying the coal-seam, known as the "Black Mine," which it was the object of the proprietor, Mr. Astley, to reach, and the temperature was found to be 75° F. Assuming the "stratum of constant temperature," or, as it is also called by Humboldt, "the invariable stratum," to be that which was reached at 16·5 feet with a temperature of 51° F., the total increase of temperature would amount to 24° F., giving as the rate of increase 1° F. for every 88·925 feet. This is much below the average rate of increase.

During a part of the period above referred to (from 1854–56) another coal-pit was being sunk at Wigan, which reached the depth of 600 yards, down to the celebrated "Cannel Mine." At this pit similar observations on the temperature of the strata were made very carefully by the manager, Mr. Bryham, which were kindly communicated to myself for publication, and will be found in my work on the 'Coalfields of Great Britain.' The ultimate temperature attained in this pit at the depth from the surface of 600 yards was found to be 72° F.; and assuming the invariable stratum to be the same as that at Dukenfield Colliery, the resulting rate of increase would be 1° F. for every 61·5 feet, which accords very closely with the

* The entire series of these interesting observations were kindly supplied to me by Mr. W. Fairbairn, and are published in 'The Coalfields of Great Britain,' 2nd edit. p. 226.

Presents received February 3, 1870.

Transactions.

- London:—Society of Antiquaries. *Archæologia*. Vol. XLII. Part 1. 4to. *London* 1869. Proceedings. Vol. IV. Nos. 3–6. 8vo. *London* 1868–69. The Society.
- Lyons:—Académie Impériale des Sciences, Belles Lettres et Arts. Mémoires. Classe des Sciences. Tome I.–IX. 8vo. *Lyon* 1851–59. Classe des Lettres. Tome I.–VI. 8vo. *Lyon* 1851–58. Annales des Sciences Physiques et Naturelles, publiées par la Société Impériale d'Agriculture. 3^e série. Tome I.–XI. 8vo. *Lyon* 1857–67. The Academy.
- Shrewsbury:—The Caradoc Field Club, Shropshire. 12mo. *Shrewsbury* 1869. The Rev. E. Donald Carr.
- Oxford:—Radcliffe Observatory. Second Radcliffe Catalogue, containing 2386 Stars, deduced from Observations extending from 1854 to 1861, and reduced to the epoch 1860 under the superintendence of the Rev. R. Main. 8vo. *Oxford* 1870. The Radcliffe Trustees.
-
- Brown (R.) On the Geographical Distribution of the *Coniferae* and *Gnetaceae*. 8vo. *Edinburgh* 1869. The Author.
- Hansen (P. A., For. Memb. R.S.) Entwicklung eines neuen veränderten Verfahrens zur Ausgleichung eines Dreiecksnetzes. 8vo. *Leipzig* 1869. Supplement zu der geodätische Untersuchungen. 8vo. *Leipzig*. The Author.
- Jenzsch (G.) Ueber eine mikroskopische Flora und Fauna krystallinischer Massengesteine (Eruptivgesteine). 8vo. *Leipzig* 1868. The Author.
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March 3, 1870.

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nation of the baric salt, or to examine any other salts of the acid, as the analysis of the acid, the silver-salt, and the ether, along with the determination of the baryta in the baric salt, I considered sufficiently indicated that the acid under examination was palmitic acid, although I could never obtain, even after fractional precipitation, a higher melting-point for the acid than 57° C.

The difference in the melting-points of the acid mass before it was treated with alcohol, and the melting-point of the palmitic acid, indicated that at least one other acid was present, but in very minute quantity.

I attempted to determine the nature of the acid of lower melting-point by exposing the residues obtained from the first three crystallizations of the hard acid to cold in a bath of sodic sulphate and hydrochloric acid, all the hard acid which crystallized out being rejected; the portion which remained fluid was saponified with potassic carbonate, and the solution of the potash soap was subjected to fractional precipitation by means of plumbic acetate; the second and smaller precipitate was collected and washed, and treated for some time at a moderate temperature with dilute sulphuric acid; this caused the separation of a reddish oily-looking liquid which was collected and dissolved in boiling alcohol; it was afterwards saponified with potassic carbonate, and the silver-salt prepared from that salt. I only obtained sufficient of the silver-salt from about 2 lbs. of oil to make one determination of the silver and one of the carbon and hydrogen, and from these determinations I did not obtain concordant results, and want of material compelled me to relinquish the further examination of the acid.

Presents received March 10, 1870.

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March 31, 1870.

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April 7, 1870.

Dr. WILLIAM ALLEN MILLER, Treasurer and Vice-President,
in the Chair.

The following communications were read:—

- I. "On Supra-annual Cycles of Temperature in the Earth's Surface-crust." By Prof. C. PIAZZI SMYTH, F.R.S. Received March 4, 1870.

(Abstract.)

The author presents and discusses the completely reduced observations, from 1837 to 1869 inclusive, of the four great earth-thermometers sunk into the rock of the Calton Hill, at the Royal Observatory, Edinburgh, by the late Principal Forbes, pursuant to a vote by the British Association for the Advancement of Science.

Leaving on one side the several natural-philosophy data which have been investigated from smaller portions of the same series of observations

plants were more varied, and the facilities for migration of species less extensive, than in the Carboniferous.

In comparing the Erian flora of America with the Devonian of Europe, we meet with the difficulty that little is known of the plants of the Lower and Middle Devonian in Europe. There are, however, specimens in the Museum of the Geological Survey which show, in connexion with facts which can be gleaned from the works of continental writers, that *Psilophyton* occupied the same important place in Europe which it did in America; and in the Upper Devonian the generic forms are very similar, though the species are, for the most part, different.

In Eastern America no land flora is known below the Upper Silurian; and even in that series the plants found are confined to the genus *Psilophyton*. Independently, however, of the somewhat doubtful Lower-Silurian plants stated to have been found in Europe, there are indications, in the Lower-Erian flora, that it must have been the successor of a Silurian flora as yet almost unknown to us; and the line of separation between this old flora and that of the Devonian proper seems to be at the base of the Middle Devonian.

In applying these facts and considerations to the questions relating to the introduction and extinction of species, and the actual relations of successive floras, it was proposed to compare what might be called specific types,—that is, forms which in any given period could not be rationally supposed to be genetically related. Of such specific types, at least fifty may be reckoned in the Erian flora; of these, only three or four are represented in the Carboniferous by identical species, while about one half are represented by allied species. The remainder have no representatives.

A Table of specific types of the Erian was given, and its bearing shown on the questions above referred to; and the hope was expressed that by separating such types from doubtful species and varietal forms, some progress might be made towards understanding, at least, the times and conditions in which specific types were introduced and perished, and the range of varietal forms through which they passed.

Presents received April 7, 1870.

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use of alcohol in rousing a failing appetite, exciting a feeble heart, and accelerating a languid capillary circulation, we have been strongly impressed with the necessity for great moderation and caution. In spite of our previous experience in the use of alcohol and brandy, we were hardly prepared for the ease with which appetite may be destroyed, the heart unduly excited, and the capillary circulation improperly increased. Considering its daily and almost universal use, there is no agent which seems to us to require more caution and more skill to obtain the good and to avoid the evil which its use entails.

We wish to guard ourselves against the supposition that in speaking of alcohol and brandy we refer at all to wine and beer, which contain substances, in addition to alcohol, which may make their action in nutrition somewhat different.

Presents received May 12, 1870.

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The Society adjourned over Ascension Day and the Whitsuntide Recess, to Thursday, June 16.

June 2, 1870.

The Annual Meeting for the election of Fellows was held this day.

General Sir EDWARD SABINE, K.C.B., President, in the Chair.

The Statutes relating to the election of Fellows having been read, Dr. Duncan and Capt. Evans were, with the consent of the Society, nominated Scrutators to assist the Secretaries in examining the Lists.

The votes of the Fellows present having been collected, the following Candidates were declared to be duly elected into the Society :—

William Froude, C.E.
Edward Headlam Greenhow, M.D.
James Jago, M.D.
Nevil Story Maskelyne, M.A.
Maxwell Tylden-Masters, M.D.
Alfred Newton, M.A.
Andrew Noble, Esq.
Capt. Sherard Osborn, R.N.

Rev. Stephen Parkinson, B.D.
Capt. Robert Mann Parsons, R.E.
William Henry Ransom, M.D.
Robert H. Scott, Esq.
George Frederic Verdon, C.B.
Augustus Voelcker, Ph.D.
Samuel Wilks, M.D.

Thanks were voted to the Scrutators.